Effect of Titanium Carbide Content on the Corrosion Behavior of Al-TiC Composites Processed by High Energy Ball Mill

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In this study, three aluminum-titanium carbide (Al-TiC) composites having the chemical composition of Al-15%TiC, Al-25%TiC, and Al-35%TiC were manufactured. The powders of the composites were ball milled in situ using a high energy ball mill and melted in a high frequency induction heat furnace before being consolidated at 1300 °C. The effect of increasing the TiC content on the corrosion of the fabricated composites in 3.5% NaCl solutions was investigated using open-circuit potential, electrochemical impedance spectroscopy, cyclic polarization, and current-time at constant potential techniques. The surface of the corroded composites was examined using scanning electron microscopy. All results were consistent with each other confirming that the resistance of Al composites against corrosion remarkably increased with increasing the TiC content in the composite. This occurred via lowering the corrosion current, corrosion rate, and the potentiostatic current with time at -100 mV vs. Ag/AgCl, as well as enhancing the polarization resistance with increasing the weight percent of TiC in the manufactured Al composite.

Keywords: Al-TiC composites; ball milling; chloride solutions; corrosion; EIS; polarization

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